

# The Irregular Ribbed Vault of the Sacristy of the Cathedral of Saint-Jean Baptiste in Perpignan

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## The Cathedral of Saint-Jean Baptiste in Perpignan<sup>1</sup>

The city of Perpignan [Roussillon, France], together with Palma, was one of the capitals of the new kingdom of Majorca, founded by James I the Conqueror, King of Aragon, on 1231 for his son, James II of Majorca. In order to fulfill the requirements of its new status, Perpignan needed a castle and a cathedral. The residence for the king, the Palace of the Kings of Majorca, had already been built by the first years of the 14th century. On the other side of the city, the project for the new cathedral progressed slowly. On 27 April 1324, King Sancho of Majorca and

Bérenger Batlle, bishop of Elna, celebrated the beginning of the construction of the new church of Saint-Jean Baptiste. The king intended to replace the former Romanesque church of Saint-Jean-le-Vieux, which was too small for the growing population of Perpignan, with a new Gothic church, and transfer the diocese of the nearby city of Elna to Perpignan. The project, as described by Alomar (1970, 105), was a three-aisle church with three apses, similar to the Cathedral of Majorca, on which construction had already started.

Despite the succession disputes caused by the death of King Sancho on 4 September 1324, only four months after the beginning of the construction, work on the building site progressed without delay. However, the fall of the kingdom of Majorca and its restoration to the Crown of Aragon, in July 1344, marked the beginning of a period of inactivity. The lack of interest on the part of the king of Aragon as well as budgetary problems almost paralyzed construction. By that time, only the choir and the apses had been built. Galceran Albert's arrival to the diocese of Elna in 1431 gave a decisive impulse to the construction. The new bishop resumed the construction of the cathedral, but introduced significant changes in the project. The three-aisle initial project was replaced by a one-aisle church with chapels within the buttresses, like Girona Cathedral. The distortions introduced by this *changement de plan* are visible in the transept of the cathedral (Fig. 2). From that moment on, the construction progressed quickly. Although the construction of the new church hadn't yet been finished, the first mass was celebrated by Bishop Joan de Margarit i de

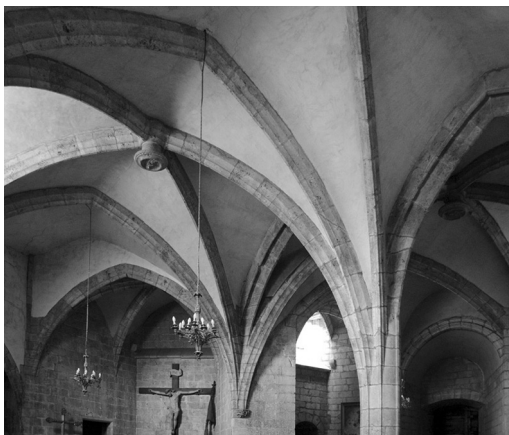


Fig. 1: General view of the sacristy of the Cathedral of Saint-Jean Baptiste in Perpignan (Photograph by Carmen Pérez de los Ríos).

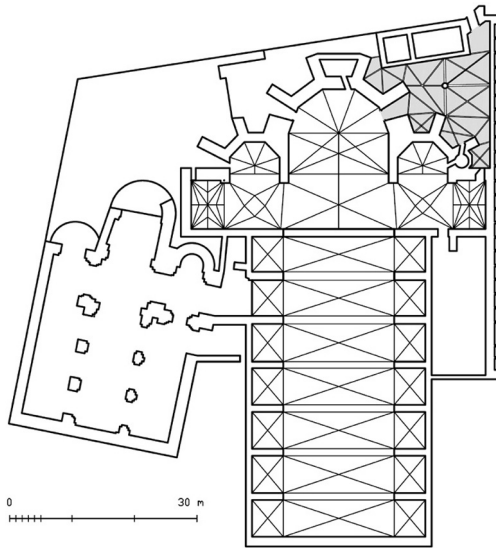


Fig. 2: Ground plan of the cathedral.

Pau on 26 August 1453, upon his arrival in the diocese of Elna. On 16 May 1509, on the 484th anniversary of the consecration of the former church of Saint-Jean-le-Vieux, the new church was consecrated.

### **Guillem Sagrera [Felanig ca. 1385 – Naples 1454]<sup>2</sup>**

In 1416, Guillem Sagrera took part in the famous architects' meeting about the construction of Girona Cathedral. Sagrera, who was one of the master masons who defended the one-aisle project, is mentioned as "master of the works of Perpignan Cathedral." Guillem Sagrera is presumed to have been born in Felanig, Majorca, around 1385. His name appears for the first time in 1397 in a document regarding the construction of the Cathedral of Palma; Guillem, along with his father Antoni and his cousin Miguel, were paid for the supply of stone for the works in the Portal del Mirador. Nothing is known about his life between 1397 and 1410. Joan Domenge believes that these years must have been crucial for Sagrera's education and the beginning of his career, and has suggested that Sagrera might have travelled through France on a training trip

(Domenge i Mesquida 2007). In 1410 his name appears for the first time in Perpignan; he may also have been connected to some work on the cathedral of Elna, such as the reinforcement of the base of the tower. The proceedings of the aforementioned architects' meeting in Girona in 1397 is the only document which connects Guillem Sagrera with the construction of the church of Perpignan. In 1420 a document testified to the sale of the family home of his wife, he is presumed to have moved to Majorca, where he took charge of the works of the Cathedral of Palma [ca. 1418/1424-1446].

In Majorca, Guillem Sagrera also built one of his masterpieces: the Lonja of Palma [1426-1446]. In 1446, after a lawsuit involving the College of Merchants of Palma, he moved to Naples, summoned by King Alfonso V to take charge of the refurbishment of Castel Nuovo, where he built the remarkable Sala dei Baroni. He died in Naples in 1454.

### *Guillem Sagrera and the "changement de forme" of the Cathedral of Perpignan*

There are no documents that prove either the presence or influence of Guillem Sagrera in the new project for the church of Saint-Jean of Perpignan instigated by Bishop Galceran Albert in 1433. After the sale of his wife's family home in Perpignan, Sagrera is presumed to have moved to Majorca and no later documents link him with Perpignan's cathedral [the architects' meeting in Girona took place twenty-five years before the change in the project]. Olivier Poisson (2002) accepted Pierre Ponsich's hypothesis about Guillem Sagrera's authorship of the new one-aisle plan. As a master mason of Palma Cathedral, Sagrera may have been at the service of Galceran Albert, who was bishop of Majorca between 1428 and 1431. Sagrera's preference for the one-aisle church was expressed in Girona. In addition, the details of Perpignan Cathedral are quite similar to those of Guillem Sagrera's works in Palma and Naples.

### **The sacristy of the Cathedral of Saint-Jean Baptiste in Perpignan**

The sacristy is situated in the southeast side of the cathedral, between the apse, the ambulatory chapel

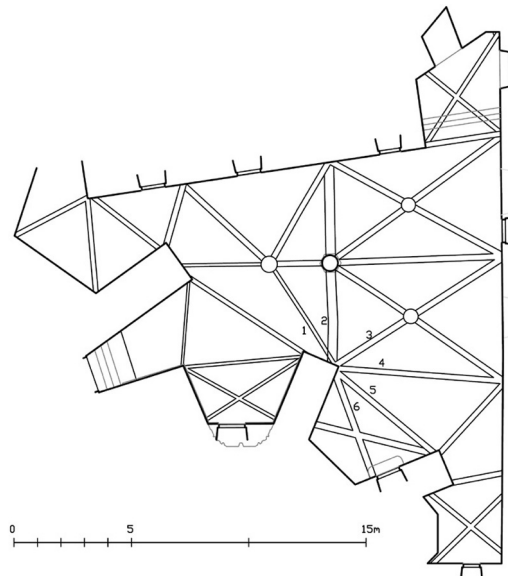


Fig. 3: Ground plan of the sacristy.

of “la Magrana” and the cathedral cloister, in a highly irregular residual space (Fig. 3). There is no documentation of its construction. We know that this space had already been used as Chapter House in the 14th century with a provisional wooden deck. In the 15th century, when the vault was constructed, this space served as sacristy, wardrobe and chapter house. In 1953 Pierre Ponsich attributed this construction to Guillem Sagrera, only on the basis of the details, which he had compared with those found in the other buildings constructed by Sagrera. Notwithstanding this lack of documentary proof, this hypothesis is generally accepted in the historiography of the Cathedral of Perpignan.

The irregular perimeter of the vestry is strongly marked by the presence of three buttresses. Such an unwelcoming location might have defeated a less skilful master, but the author overcame the constraints imposed by the existing construction through the use of a single column placed at the center of the plan which supports the network of pointed arches that articulates the vault. The central column has a circular shaft set on a hexagonal base. The ribs meet the column at different heights and penetrate into the volume directly, without capitals. Six mouldings, the only remaining traces

of the ribs, run down the shaft and terminate in the base. In spite of the irregularity of the plan and the apparent chaos of the ribs, the column is almost symmetrical about a north-south plane.

The ribs also reach the perimeter walls at different heights. The *tas-de-charge* supports of the ribs are solved again without any transitional element and the ribs penetrate directly into the mass of the wall. Contrary to what happens in the column, here the ribs fully penetrate into the wall. In all the supports, the rib reaches the wall vertically and tangent to it (Fig. 4). These constructive details are not unusual in Sagrera’s work; the support solutions in the Lonja of Palma are particularly illustrative of this masterly way of resolving the *tas-de-charge* without any decoration.

There are many precedents for arrangements in which multiple ribs spring from a central support in the fashion of a stone palm tree, from the Mozarabic chapel of San Baudelio de Berlanga in Soria, Spain [tenth century], to the English chapter houses in the cathedrals of Salisbury [1320] and Wells [1306], or the peculiar church in Greifensee, Zurich [1340]. What makes the vault of the Perpignan vestry unique is its irregular perimeter, and the brilliant solution devised by Sagrera, mastering the versatility of late Gothic rib vaulting.

In Narbonne, 65km north of Perpignan, we find another irregular plan resolved by means of a central support: the kitchen in the ground plan of the Archbishop’s Palace [currently the museum shop]. The plan of this space, an irregular quadrilateral, is easier to resolve; however, the existence of an opening that communicates with the first floor somewhat complicates the layout of the vault. The supports on the perimeter walls are provided by attached pilasters along which the ribs continue to the floor without capitals. In the central column, the ribs penetrate directly into the shaft. These details recall those that we find in the sacristy of Perpignan, resolved in a less refined way.<sup>3</sup>

#### *An apparent capriccio*

Because the vestry is a functional space in a restricted area, and taking into account the way Sagrera has treated the other supports, the presence of an isolated corbel decorated with flamboyant

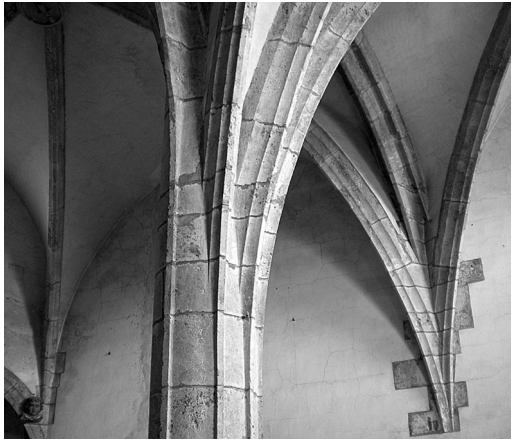


Fig. 4: Springing solutions.

foliage to resolve the *tas-de-charge* of a group of six ribs is astonishing. In accordance with the logic of the constructive system proposed by Sagrera, the presence of this detail can only be explained on the basis of constructive requirements (Fig. 5). Pierre Ponsich has already focused attention on this support in his article of 1953, in which he expresses his admiration for the mastery of Guillem Sagrera and the way he had solved the intricate problem of the vault and its constructive details. Ponsich not only draws attention to the corbel but also identifies the intriguing presence of a non-explained vertical edge of a dihedral angle in this *tas-de-charge* over the corbel. Ponsich gives no explanation for the presence of the corbel but explains the existence of the edge by the fact that an upper rib, which would have already penetrated in the group of ribs, reappears when the other ribs have disappeared into the wall. This part of the article identifies with great accuracy the crucial point of the vault, but no further studies have developed his ideas.

### Survey and analysis of the ribbed vault of the Sacristy

We began the study of the vault and its construction process with a study of the overall geometry of the vault. The first survey of the vault was carried out with convergent photogrammetric software. After an initial visit to the Sacristy, which allowed

us to take several photographs and some measures, we prepared a first reconstruction of the form of the vault. By means of this process, we obtained the plan of the vestry, which differed slightly from those published by Ponsich (1953) and Alomar (1970), and the three-dimensional trajectory of the ribs. In trying to explain the presence of the edge in this support, we realized that we needed the exact profile of every rib and the precise position and orientation of the two faces of the edge in order to determine to which rib it belonged, thus necessitating a second survey. This was carried out using a long distance 3D laser scanner to obtain the profile of the ribs, and a laser total station in order to take a number of significant points.

### A possible explanation for the layout of the vault

The only source of information about the construction of the vault which could explain the



Fig. 5: Detail of the corbel.



presence of the corbel and the vertical edge is the vault itself, which must be analyzed on the basis of the theory of Gothic rib vault construction.

#### *Rib vault construction by means of templates*

Aside from their widely discussed structural value, one of the main constructive functions of the ribs in Gothic vaults is the geometric definition of the form the vault. A Gothic rib vault is composed by a three-dimensional mesh of ribs, which are semicircular arches usually contained in vertical planes, and the webs, that fill the space between ribs. When the curvature of the rib and its section [defined by the template] are known, its construction is trivial and the only difficulties are concentrated in two points: the springing [*tas-de-charge*] and the intersections [keystones].

The design, control and construction of the vault are made by means of only three drawings: the plan of the ribs, the elevation of each rib, and its section [template]. The ribs in the *tas-de-charge* have no voussoirs but are divided by horizontal beds. The horizontal planes of the upper and lower beds are dressed first. Then the templates are placed over them, aligned with the plan of the rib, at a suitable distance from the axis, which is easily obtained from the elevation of the rib. Taking these horizontal sections over the upper and lower beds as a reference, the stonemason dresses the exterior surface. A certain amount of experience is needed to do this, as well as an observation of the fact that certain mouldings are in one bed but not the other, and so should disappear as they proceed (Rabasa and Calvo 2009).

#### *The layout of the vault plan and the mesh of ribs*

The column, placed at the midpoint between the buttress and the service buildings at the east end of the space,<sup>4</sup> articulates the ground plan. Two pointed arches with concave-convex sections link the buttress and the east wall; these two arches effectively divide the space of the sacristy in two. The concave-convex sections of these arches are shared by the arch joining the buttresses of the chapel and the choir; the other ribs have simpler, double-concave sections, with a smaller width. The southern portion, bounded by the graveyard to the south, has a more regular perimeter. Two

pointed ribs divide the vault in two skewed rectangles, each one solved by a quadripartite vault, and a residual triangular web. The perimeter of the north division is strongly marked by the choir buttresses; this part is covered by a single five-rib vault. The presence of the virtual separation created by the two pointed arches and the consequent regularity of the southern part of the space, leads us to believe that this was the main space, while the north part of the sacristy was a passing space.

#### *Hypothesis about the corbel and the edge*

The corbel solves the problem of the support of a group of six different ribs, numbered 1-6 on the plan shown in Figure 2. The edges of these ribs meet the wall at different heights: arch no.2 arrives at the highest point of the *tas-de-charge*, disappearing in the group of ribs; the ribs from the southern vault [nos. 3, 4, 5, 6] arrive at more or less the same height, which is approximately that of the corbel. However, the edge of the rib from the north vault [no.1] doesn't intersect the wall, as its development is cut off by the corbel. Reconstructing the theoretical development of this last rib it would have met the wall at a much lower point [around 77cm below the corbel];<sup>5</sup> this would have made it necessary to remove a large number of blocks to resolve the *tas-de-charge*. The alternative of placing the springing of this rib at a higher point would have been impossible, due to its length and the position of the keystone.

The corbel also cuts off the development of the intriguing vertical edge, which would have run through the wall to the floor if its trajectory had not been cut off by the corbel. Taking into account the position of the edge and the orientation of its sides, the edge can only be explained by two of the ribs. The first applicant is arch no.2, coming from the column; this arch has already disappeared into the group of ribs, but after all the ribs have disappeared into the wall, the section of the arch reappears due to the fact that this arch is not tangent to the wall by some millimeters. The second possibility is that the corner belongs to the extrados of rib no.6, the diagonal rib between buttresses.

The most suitable hypothesis is the first one, as the extrados of rib no.6 is invisible and Sagrera

could have done without it. Curiously, the position of the column in the midpoint of the space between the buttress and the wall would have allowed Sagrera to resolve the two spans with the same pointed arch and the edge would never have appeared; but unexpectedly, he slightly reduced the span of the first one, forcing him to use two slightly different arches and making the edge appear (Fig. 6). This can't be explained as an error during construction, as the *tas-de-charge* is the first part to be built; the presence of the edge was decided when the construction began. Taking this into account, we can advance a hypothesis regarding the presence of the corbel. The length of rib no.1, which is the longest one of the vault and whose elevation is determined by the position of the keystone, forces Sagrera to place the corbel in order to cut off its development on a previously constructed element, the buttress. Besides, one of the sides of the corbel is parallel to this rib. We can presume that Sagrera, forced by the aforementioned reason to place the corbel, decided to exploit this detail, shortening the span of one of the pointed arches and making the edge appear, to show his mastery of Gothic construction by means of templates. But this explanation remains hypothetical (Fig. 7).

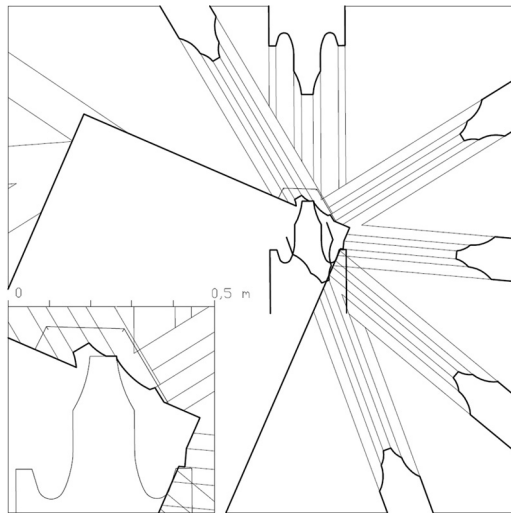


Fig. 6: Analysis of the form of the *tas-de-charge* by means of templates.

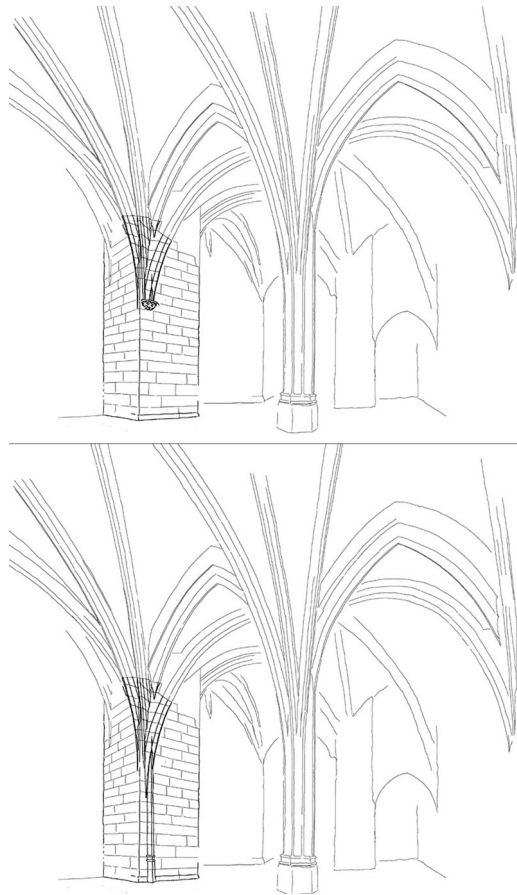


Fig. 7: Sagrera's constructive solution with the corbel (top) and alternative solution for the support (bottom).

The vault of the sacristy of the Cathedral of Perpignan is a paradigmatic example of the flexibility of late Gothic construction. The vault is strictly functional, solved with the most economical means and without concessions to aesthetics. This is particularly evident if we compare the number of ribs between the vault in Perpignan and the vault of the church in Greifensee, Zurich, where the surfaces of the webs almost disappear under the mesh of ribs; in contrast, Perpignan's vault has no unnecessary ribs. On that basis, not only the presence of the corbel is surprising, but so is the careful execution of the details, particularly in the different *tas-de-charge*, where the ribs intersect and disappear into the walls.

The presence of the corbel has been justified by the constructive logic of Gothic vaulting system. A less careful construction [or a less skilful master mason] would have done it without a corbel, not obeying the geometrical logic, or with corbels at every support. The mastery of Guillem Sagrera, and a certain degree of “constructive honesty,” forces him to provide a clean way to cut the rib. On the other hand, the survey of the ribs has proved that the presence of the isolated edge over the corbel could have been avoided. We can only explain its striking presence due to an attempt to carry out the constructive logic of the system to the very end.

Aside from the intrinsic difficulties created by the irregularity of the ground plan, this vault has no particular requirements. A functional space, in a restricted residual area, is not a significant problem; nothing was risked. The mastery in the execution of the vault and its details can only be explained if we consider this vault as a field test, a uncompromised place to try out the constructive solutions he would later develop.

Waiting for further research on the works built by Guillem Sagrera and his constructive details, we can only willingly accept Pierre Ponsich's hypothesis about the authorship of this masterpiece. The details that we have found in the Sacristy, with an absolute control of the ribs and the *tas-de-charge*, can only be attributed to the author of the astonishing details of the Lonja of Palma and in Castel Nuovo (Rabasa et al. 2012).

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### NOTES

1. Pierre Ponsich's article remains the most comprehensive research on the history of the cathedral (Ponsich, 1953).
2. Gabriel Alomar's book about Guillem Sagrera is still the obligatory reference book on the figure of the Majorcan architect (Alomar, 1970). Joan Domenge i Mesquida, professor at the University of Barcelona, is currently developing a research project about Sagrera about whom he has already published numerous articles (Domenge i Mesquida 2003; 2007; 2009).
3. We would like to thank Carmen Pérez de los Ríos for having located this peculiar room.

4. The way the north-west corner of these service spaces is resolved, rounding slightly the lower part of the corner and placing a transition element between the rounded corner and the upper edge, leads to believe that these buildings were built earlier, as this is a solution we usually find on the exterior of the buildings.

5. The curvature of this rib in the *tas-de-charge* is not exactly the same than in the rest of its development. To reconstruct its trajectory we have considered the first curvature.

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